Forecasting Elections in Europe: Synthetic Models

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Introduction

- Focus is scientific, as opposed to nonscientific approaches to election forecasting (for reviews see Lewis-Beck & Tien, 2012; Norporth & Stegmaier, 2013)
- e.g. 2012 US presidential election
- Three dominant scientific approaches to forecasting (Lewis-Beck & Stegmaier, 2014)
  - Structuralists
  - Aggregators
  - Synthetizers
- Three approaches can be delineated by their application of theory, data and time

Approaches: United States

A. Structuralists

1. Offer a theoretical model of the election outcome, usually with core political economy explanation

   vote = f(presidential popularity, economic growth)

2. Unit of analysis is usually the nation
3. OLS estimation on single equations
4. Estimation is static, rather than dynamic → unique final forecast

Approaches: United States

B. Aggregators (e.g. Blumenthal, Traugott, Jackman)

1. Aggregate vote intention in opinion polls
2. Cfr. *Real Clear Politics*
3. Offer no theory of the vote
4. Unit of analysis is usually the nation
5. Forecasting is dynamic → repeated estimates across the campaign

Approaches: United States

C. Synthetizers (e.g. Erikson & Wlezien, Linzer, Silver)

1. Borrow from Structuralists and Aggregators
   - Start with political economy theory of the vote
   - Add aggregated and updated polling preferences
2. Data analyzed at national/state level
3. Analysis may include multiple equations (may be Bayesian)
4. Forecasts are updated → repeated estimates across the campaign

Approaches: United States

➔ These models join election theory with strengths of aggregation and dynamic updating and will be focus of our European efforts here

Europe: State of the art

A. Structural models

1. Structural models dominate
2. Tend to be based on political economic theory of voting
3. Modeling is single-country, OLS single equations work
4. Estimation is static → one unique forecast
5. Unit of analysis is usually, not always, the nation

Europe: State of the art

6. Typical French example, with region as the unit of analysis (Dubois & Fauvelle-Aymar, 2004: 216)

$V = 35.97^{*} + 8.44^{*}P - 0.17^{*}E + e$

Adj. $R^2 = 0.81$; N = 110 (regions 1986-2002)

where V = legislative vote share of parties on the left, first- round; P = popularity of parties on the left, SOFRES polls, three months prior to election; E = regional unemployment rate from quarter before the election. Note that model fits French data about as well as it fits US data.

Europe: State of the art

B. Aggregators

1. Combining polls and systematically using them to forecast is almost non-existent

   → see Jennings & Wlezien (2013) for an exception

2. Using individual polls on vote intention to forecast does represent a long-standing tradition, especially within the media (cfr. work on UK, since 1970s and Whitley & Sanders)

Europe: State of the art

C. Synthesizers

1. We know of no examples of synthetic models on national elections in Europe
2. Although there might be one!

Building synthetic models for elections in Europe

Aim: to combine a sound Structural Model with a sound Aggregate Polling Model

→ Forming a hybrid, Synthetic model to forecast national election outcomes accurately, across a sample of European democracies

Building synthetic models for elections in Europe

I. Proposed Structural Model, with a political economy core

V_t = f(Economy, Government Support)

Operationally: V_t = f(GDP_{t-x}, Satisfaction with $government_{t-x}$)

II. Aggregate Polling Model, predicting incumbent vote share as a function of (aggregated) vote intention

V_t = f($Vote\ intention_{t-x}$)

Operationally: V_t = f($Median\ Vote\ Intention_{t-x}$)

Building synthetic models for elections in Europe

III. The Synthetic Model

1. Begins with long-term fixed effects from electoral theory: Structural Model
2. Adds short-term effects induced by other forces: Polling Model, with its use of Median Vote Intention (Vi_{t-x})
3. To the extent Vi_{t-x} is significant and reduces error, we can show how over time it improves the forecast

Building synthetic models for elections in Europe

4. Offers combination of theory and empirics, in dynamic form, with progressive re-estimations as election becomes closer (cfr. Erikson & Wlezien, 2013 on US)
5. For purposes of pedagogy, estimation is non-Bayesian, and discrete, i.e. Estimates are at monthly intervals, t-6 to t-1
6. In terms of general approach, the Synthetic model operates much like contemporary Weather Forecasting Models (Lewis-Beck & Stegmaier, 2014).

The Analysis strategy in practice

1. On each European country, we first estimate the Structural Model (at t-6)
2. Then, we estimate the Aggregate Polling Model (t-6 to t-1)
3. Finally, we estimate a combined, single equation Synthetic Model (t-6 to t-1)

   - Dynamic assumes that while Structural Model is fixed, the Aggregate Polling Model moves each month

   - Allows a new 'nowcast' for the election result with each passing month (Lewis-Beck & Tien, 2012, 2014)

The Analysis strategy in practice

4. For our initial tests, we look at three different parliamentary democracies of Western Europe:

   - Germany (1980-2013)

   - Norway (1981-2013)

   - United Kingdom (1959-2010)

Structural models

Vote = f(GDP_{t-6}, Satisfaction with government)

	Germany (N=9)	
	Coef.	S.E.
Satisfaction government (-6 months)	3.612*	(1.022)
GDP growth rate (-2Q)	1.706**	(0.301)
Constant	27.227**	(5.393)
R^2	0.873	
RMSE	2.741	
DW-statistic	3.085	
Max. VIF	1.01	

Structural models

Vote = f(GDP_{t-6}, Satisfaction with government)

	Norway (N=9)	
	Coef.	S.E.
Incumbent vote share midterms	1.109 **	(0.224)
GDP growth rate (-2Q)	0.463	(0.425)
Constant	-3.494	(8.123)
R^2	0.805	
RMSE	3.910	
DW-statistic	2.184	
Max. VIF	1.02	

Structural models

Vote = f(GDP_{t-6}, Satisfaction with government)

	United Kingdom (N=14)	
	Coef.	S.E.
Satisfaction government (-6 months)	0.412**	(0.123)
GDP growth rate (-2Q)	0.553	(0.417)
Constant	24.097***	(4.401)
R^2	0.579	
RMSE	4.074	
DW-statistic	1.790	
Max. VIF	1.04	

Evaluation: Structural Models

Criteria for evaluation: Accuracy, Lead, Parsimony, Replication, Currency (Lewis-Beck, 2005; Lewis-Beck & Tien, 2014):

- Accuracy: R^2: .58 to .87 RMSE: 2.7 to 4.1
- Lead: 6 months
- Parsimony: Two explanatory variables
- Replication: Doable
- Currency: Static, from 6 months on

Best of 3 countries: Germany (highest fit, lowest error, lowest collinearity).

Polling Models (Germany)

	6 months	5 months	4 months	3 months	2 months	1 month
	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Polling result (median)	0.947** (0.249)	0.626* (0.255)	0.724* (0.255)	0.747** (0.161)	0.896** (0.192)	0.822** (0.155)
Constant	6.237 (10.838)	17.061 (11.197)	13.754 (11.517)	13.304 (7.382)	6.939 (8.507)	8.611 (7.137)
N	9	8	10	9	8	7
R^2	0.673	0.502	0.503	0.754	0.784	0.848
RMSE	4.062	4.760	5.134	3.523	3.323	3.010
DW-statistic	0.928	1.419	1.795	1.830	2.101	1.090

Polling Models (Norway)

	6 months	5 months	4 months	3 months	2 months	1 month
	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Polling result (median)	0.585** (0.135)	0.744*** (0.130)	0.687*** (0.087)	0.794** (0.192)	0.766*** (0.114)	0.801*** (0.087)
Constant	15.805* (5.069)	8.796 (4.849)	12.718*** (3.191)	8.870 (7.322)	8.708° (4.363)	7.231° (3.267)
N	11	11	11	8	12	11
R^2	0.676	0.798	0.873	0.740	0.819	0.904
RMSE	4.348	3.434	2.718	4.155	3.152	2.243
DW-statistic	1.904	2.164	1.519	1.891	2.136	1.819

Polling Models (United Kingdom)

	6 months	5 months	4 months	3 months	2 months	1 month
	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Polling result (median)	0.575** (0.160)	0.727** (0.167)	0.767*** (0.155)	0.756*** (0.135)	0.728*** (0.092)	0.799*** (0.099)
Constant	15.995* (6.574)	10.445 (6.859)	8.915 (6.361)	8.776 (5.651)	9.385* (3.935)	6.635 (4.182)
N	13	14	14	14	14	14
R^2	0.539	0.581	0.671	0.723	0.838	0.844
RMSE	3.765	3.740	3.450	3.166	2.416	2.370
DW-statistic	0.815	0.825	0.698	0.897	1.069	1.120

Evaluation: Polling Models

- Accuracy: R^2: .50 to .90 RMSE: 2.3 to 5.1
- Lead: 6 months down to 1 month
- Parsimony: One predictive variable
- Replication: Very doable
- Currency: Dynamic, from 6 months to 1 month

Best of 3 countries: Norway (highest R^2 range, .68 to .90; lowest RMSE, 2.2; best D-W)

Best lead = 1 month (2.2-3.0); > one month, best lead = 2 months (2.4-3.3)

Synthetic Models (Germany)

	6 months	5 months	4 months	3 months	2 months	1 month
	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Satisfaction Gov. (-6 months)	2.017 (1.866)	4.009 (4.626)	1.502 (1.871)	1.010 (2.038)	0.937 (5.510)	1.325 (1.657)
GDP growth (-2Q)	1.360* (0.453)	1.870 (1.266)	1.262* (0.441)	1.118° (0.494)	1.026 (1.560)	0.972 (0.454)
Polling result (median)	0.356 (0.349)	0.029 (0.612)	0.374 (0.284)	0.419 (0.291)	0.440 (1.002)	0.452 (0.269)
Constant	20.373° (8.605)	24.083° (8.185)	21.819* (6.541)	22.142* (6.095)	21.605 (18.018)	18.211° (6.745)
N	9	7	9	9	8	7
R^2	0.894	0.883	0.905	0.910	0.865	0.895
RMSE	2.732	3.003	2.587	2.524	3.213	2.282
DW-statistic	3.147	2.923	2.677	3.005	2.795	2.147
Max. VIF	4.33	14.21	4.82	6.36	29.13	5.19

Synthetic Models (Norway)

	6 months	5 months	4 months	3 months	2 months	1 month
	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Incumbent vote midterms	0.888 (0.756)	0.522 (0.546)	0.363 (0.373)	0.119 (0.866)	0.449 (0.401)	0.372° (0.152)
GDP growth (-2Q)	0.509 (0.881)	0.306 (0.697)	0.347 (0.490)	3.806 (4.384)	0.002 (0.607)	-0.203 (0.254)
Polling result (median)	0.226 (0.495)	0.535 (0.372)	0.576° (0.215)	1.220 (0.729)	0.559 (0.247)	0.659** (0.095)
Constant	-3.038 (14.416)	-0.994 (10.816)	3.959 (8.402)	-8.306 (20.909)	0.592 (8.816)	-0.509 (3.552)
N	8	8	8	5	8	8
R^2	0.781	0.848	0.918	0.926	0.899	0.982
RMSE	4.576	3.810	2.803	0.704	3.105	1.300
DW-statistic	2.287	2.448	2.038	0.738	2.399	2.930
Max. VIF	7.13	5.36	4.61	7.17	3.14	3.59

Synthetic Models (United Kingdom)

	6 months	5 months	4 months	3 months	2 months	1 month
	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)	Coef (S.E.)
Satisfaction Gov. (-6 months)	0.098 (0.186)	0.129 (0.160)	0.211° (0.109)	0.172 (0.121)	0.067 (0.114)	0.105 (0.102)
GDP growth (-2Q)	0.552 (0.387)	0.618 (0.351)	0.486 (0.301)	0.358 (0.318)	0.141 (0.286)	0.094 (0.276)
Polling result (median)	0.476° (0.238)	0.560* (0.228)	0.559** (0.160)	0.566** (0.170)	0.651** (0.150)	0.692** (0.149)
Constant	15.288* (6.570)	11.047 (6.471)	8.624 (5.436)	9.592 (5.454)	9.903* (4.322)	7.141 (4.528)
N	14	14	14	14	14	14
R^2	0.636	0.723	0.741	0.789	0.846	0.860
RMSE	3.703	3.464	2.938	3.024	2.584	2.468
DW-statistic	1.279	1.370	1.392	1.386	1.173	1.169
Max. VIF	2.29	2.19	1.46	1.74	2.31	2.09

Evaluation: Synthetic Models

- Accuracy: R^2: .64 to .98 RMSE: 0.7 to 3.7
- Lead: 6 months down to 1 month
- Parsimony: Two explanatory and one predictor variable
- Replication: Doable
- Currency: Dynamic, from 6 months down to 1 month

Best of 3 countries: Norway (at t-1, best R^2, second best RMSE, acceptable collinearity)

Best lead = 1 month (1.3-2.5); > 1 month, best lead = 3 months (0.7-3.0)

Evaluation: Structural vs. Polling Models

A. Taken alone, Structural Model > Polling Model, i.e. better R^2, less error, more lead, better explanation

B. Is the addition of the Polling Model, to form the Synthetic Model, worth it?

- Yes, it offers clear reduction in error, and is dynamic

-However, error reduction is not large, and loss of lead is not small (optional model only 1 month out)

-But, almost same accuracy can be gained at 3 months out

Conclusions

- Synthetic models are worth pursuing, if one wishes to gain accuracy in forecasting national elections in Europe
- Next steps:
  - Extension to more European countries
  - Extension to subnational units, in order to:
    - Gain statistical power
    - Focus on a lower, perhaps more relevant, unit of analysis